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| FORM PTO-1390 (REV. 9-2001) | | U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE | | ATTORNEY'S DOCKET NUMBER | |
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | | | AZ 3049 U.S. APPLICATION NO. (if known, see 17 C.F.R. 1.51) Not Associated 10/031923 | |
| INTERNATIONAL APPLICATION NO. | | INTERNATIONAL FILING DATE | | PRIORITY DATE CLAIMED | |
| PCT/EP00/06716 | | 14 July 2000 | | 21 July 1999 | |
| TITLE OF INVENTION | | | | | |
| APPARATUS FOR TREATING SUBSTRATES | | | | | |
| APPLICANT(S) FOR DO/EO/US | | | | | |
| Ulrich Speh, Jens Schneider, Marc Meuris | | | | | |
| Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: | | | | | |
| 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. | | | | | |
| 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. | | | | | |
| 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. | | | | | |
| 4. <input type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). | | | | | |
| 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) | | | | | |
| a. <input type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). | | | | | |
| b. <input checked="" type="checkbox"/> has been communicated by the International Bureau. | | | | | |
| c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). | | | | | |
| 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). | | | | | |
| a. <input checked="" type="checkbox"/> is attached hereto. | | | | | |
| b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4). | | | | | |
| 7. <input type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) | | | | | |
| a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). | | | | | |
| b. <input type="checkbox"/> have been communicated by the International Bureau. | | | | | |
| c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. | | | | | |
| d. <input type="checkbox"/> have not been made and will not be made. | | | | | |
| 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371 (c)(3)). | | | | | |
| 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). | | | | | |
| 10. <input type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). | | | | | |
| Items 11 to 20 below concern document(s) or information included: | | | | | |
| 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. | | | | | |
| 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. | | | | | |
| 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. | | | | | |
| 14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. | | | | | |
| 15. <input type="checkbox"/> A substitute specification. | | | | | |
| 16. <input type="checkbox"/> A change of power of attorney and/or address letter. | | | | | |
| 17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825. | | | | | |
| 18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). | | | | | |
| 19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). | | | | | |
| 20. <input type="checkbox"/> Other items or information: | | | | | |
| "Express Mail" Mailing Label Number EV 021 936 786 US Date of Deposit 1/22/2002 (Tuesday after Holiday) I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of patents and trademarks, Washington, D.C. 20231. | | | | | |
| Rosalie Centeno | | | | | |
| Rosalie A. Centeno | | | | | |

JC13 Rec'd PCT/PTO 22 JAN 2002

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|--|------------------|---|-------------------|---|--------------|--------------|------|--------------|------------------|----------|------------------|--------------------|----------------|----------|------------------|---|--|--|-------------------|--------------------------------------|--|--|------------------|--|--|
| U.S. APPLICATION NO. (If known, use J or K) 10/031923 | | INTERNATIONAL APPLICATION NO. PCT/EP00/06716 | | ATTORNEY'S DOCKET NUMBER AZ 3049 | | | | | | | | | | | | | | | | | | | | | |
| 21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO. \$1040.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO \$890.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT = | | | | CALCULATIONS PTO USE ONLY | | | | | | | | | | | | | | | | | | | | | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)). | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table><tr><td>CLAIMS</td><td>NUMBER FILED</td><td>NUMBER EXTRA</td><td>RATE</td></tr><tr><td>Total claims</td><td>13 - 20 =</td><td>0</td><td>x \$18.00</td></tr><tr><td>Independent claims</td><td>1 - 3 =</td><td>0</td><td>x \$84.00</td></tr><tr><td colspan="3">MULTIPLE DEPENDENT CLAIM(S) (if applicable)</td><td>x \$280.00</td></tr><tr><td colspan="3">TOTAL OF ABOVE CALCULATIONS =</td><td>\$ 890.00</td></tr></table> | | | | CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | Total claims | 13 - 20 = | 0 | x \$18.00 | Independent claims | 1 - 3 = | 0 | x \$84.00 | MULTIPLE DEPENDENT CLAIM(S) (if applicable) | | | x \$280.00 | TOTAL OF ABOVE CALCULATIONS = | | | \$ 890.00 | | |
| CLAIMS | NUMBER FILED | NUMBER EXTRA | RATE | | | | | | | | | | | | | | | | | | | | | | |
| Total claims | 13 - 20 = | 0 | x \$18.00 | | | | | | | | | | | | | | | | | | | | | | |
| Independent claims | 1 - 3 = | 0 | x \$84.00 | | | | | | | | | | | | | | | | | | | | | | |
| MULTIPLE DEPENDENT CLAIM(S) (if applicable) | | | x \$280.00 | | | | | | | | | | | | | | | | | | | | | | |
| TOTAL OF ABOVE CALCULATIONS = | | | \$ 890.00 | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2. | | | | | | | | | | | | | | | | | | | | | | | | | |
| SUBTOTAL = | | | | \$ 890.00 | | | | | | | | | | | | | | | | | | | | | |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)). | | | | | | | | | | | | | | | | | | | | | | | | | |
| TOTAL NATIONAL FEE = | | | | \$ 890.00 | | | | | | | | | | | | | | | | | | | | | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property | | | | | | | | | | | | | | | | | | | | | | | | | |
| TOTAL FEES ENCLOSED = | | | | \$ 890.00 | | | | | | | | | | | | | | | | | | | | | |
| | | | | Amount to be refunded: | | | | | | | | | | | | | | | | | | | | | |
| | | | | charged: | | | | | | | | | | | | | | | | | | | | | |
| a. <input checked="" type="checkbox"/> A check in the amount of \$ 890.00 to cover the above fees is enclosed. | | | | | | | | | | | | | | | | | | | | | | | | | |
| b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed. | | | | | | | | | | | | | | | | | | | | | | | | | |
| c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit to any overpayment to Deposit Account No. 02-1653 . A duplicate copy of this sheet is enclosed. In the event there is any discrepancy in the amount sent herewith or at any time in the future please charge any additional fee, credit or overpayment to the above deposit account number. | | | | | | | | | | | | | | | | | | | | | | | | | |
| d. <input type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. | | | | | | | | | | | | | | | | | | | | | | | | | |
| NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status. | | | | | | | | | | | | | | | | | | | | | | | | | |
| SEND ALL CORRESPONDENCE TO: | | | | | | | | | | | | | | | | | | | | | | | | | |
| ROBERT W. BECKER & ASSOCIATES 11896 N. HIGHWAY 14 SUITE B TIJERAS, NEW MEXICO 87059 | | | | Robert W. Becker SIGNATURE Robert W. Becker NAME 26,255 REGISTRATION NUMBER | | | | | | | | | | | | | | | | | | | | | |

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

"Express Mail" Mailing Label Number: EV 021 936 786 US

Date of Deposit January 22, 2002 (Tuesday - after holiday)

I hereby certify that this paper and/or fee is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, D.C. 20231.

Rosalie A. Centeno
Rosalie A. Centeno, Secretary

In the Application of Ulrich Speh

Ser.No.: Not Yet Known (Based on PCT/EP00/06716 filed July 14, 2000 and German priority document 199 34 300.4 filed July 21, 1999)

For: APPARATUS FOR TREATING SUBSTRATES

Filed on: January 22, 2002

Assistant Commissioner for Patents

Washington, DC 20231

PRELIMINARY AMENDMENT ACCOMPANYING PCT NATIONAL STAGE APPLICATION

Sir:

Prior to examination, please amend the above-identified application as follows.

IN THE SPECIFICATION:

On page 1, immediately after the title, please insert the following heading:

--Background of the Invention--.

On page 2, between lines 5 and 6, please insert the following heading:

--Summary of the Invention--.

On page 6, between lines 3 and 4, please insert the following heading:

--Brief Description of the Drawings--;

On page 6, line 11, please insert the following heading:

--Description of Preferred Embodiments--.

On page 9, line 8, please replace "drying chamber 33" with --"drying chamber 32"--.

17. An apparatus for treating substrates, comprising:

at least one essentially closed process container, which is disposed is a gas atmosphere, contains a treatment fluid and has at least two continuously open openings for a linear guidance of substrates through said at least one process container;

an essentially closed overflow container that is mounted on said at least one process container and has an overflow means disposed above said openings of said at least one process container;

an inlet means for treatment fluid, wherein said inlet means is disposed below said openings of said at least one process container; and

a device for generating an underpressure in said at least one process container.

18. An apparatus according to claim 17, wherein a height of said overflow means is adjustable.

19. An apparatus according to claim 17, wherein an essentially horizontally disposed diffuser plate is provided in said at least one process container.

20. An apparatus according to claim 17, wherein a collecting trough is mounted on an outer periphery of said at least one process container below at least one of said openings thereof.

21. An apparatus according to claim 20, wherein a drip catcher is disposed in said collecting trough.

22. An apparatus according to claim 17, wherein at least one ultrasonic unit is provided within said at least one process container.

23. An apparatus according to claim 22, wherein said at least one ultrasonic unit extends over the entire width of said at least one process container.

24. An apparatus according to claim 22, wherein said at least one ultrasonic unit is beveled on a rear side thereof in order to provide an aerodynamic shape.

25. An apparatus according to claim 22, wherein at least two ultrasonic units are provided that face one another, and wherein at least one respective ultrasonic unit is disposed above and below a level of said openings respectively so that a substrate is movable between said ultrasonic units.

26. An apparatus according to claim 17, wherein a drying chamber is provided that surrounds an outlet opening of said at least one process container, and wherein said drying chamber is provided with a device for introducing a fluid that reduces a surface tension of said treatment fluid.

27. An apparatus according to claim 17, wherein a plurality of process containers are disposed one after another.

28. An apparatus according to claim 27, wherein means are provided for introducing different treatment fluids into said process containers.

29. An apparatus according to claim 27, wherein a respective wetting unit is disposed between each two process containers.

17. An apparatus for treating substrates, comprising:

at least one essentially closed process container (8), which is disposed in a gas atmosphere, contains a treatment fluid (20) and has at least two continuously open openings (15,16) for a linear guidance of substrates (3) through said at least one process container;

an essentially closed overflow container (42) that is mounted on said at least one process container (8) and has an overflow means (44) disposed above said openings (15,16) of said at least one process container;

an inlet means (22) for treatment fluid (20) wherein said inlet means is disposed below said openings (15,16) of said at least one process container (8) and

a device (37) for generating an underpressure in said at least one process container.

18. An apparatus according to claim 17, wherein a height of said overflow means (44) is adjustable.

19. An apparatus according to claim 17, wherein an essentially horizontally disposed diffuser plate (22) is provided in said at least one process container (8).

20. An apparatus according to claim 17, wherein a collecting trough (30) is mounted on an outer periphery of said at least one process container (8) below at least one of said openings (15,16) thereof.

21. An apparatus according to claim 20, wherein a drip catcher (36) is disposed in said collecting trough.

* For Examiners reference *

22. An apparatus according to claim 17, wherein at least one ultrasonic unit (24,26) is provided within said at least one process container (8).

23. An apparatus according to claim 22, wherein said at least one ultrasonic unit (24,26) extends over the entire width of said at least one process container (8).

24. An apparatus according to claim 22, wherein said at least one ultrasonic unit (24,26) is beveled on a rear side thereof in order to provide an aerodynamic shape.

25. An apparatus according to claim 22, wherein at least two ultrasonic units (24,26) are provided that face one another, and wherein at least one respective ultrasonic unit is disposed above and below a level of said openings respectively so that a substrate (3) is movable between said ultrasonic units.

26. An apparatus according to claim 17, wherein a drying chamber (32) is provided that surrounds an outlet opening (16) of said at least one process container (8) and wherein said drying chamber is provided with a device (34,35) for introducing a fluid that reduces a surface tension of said treatment fluid (20).

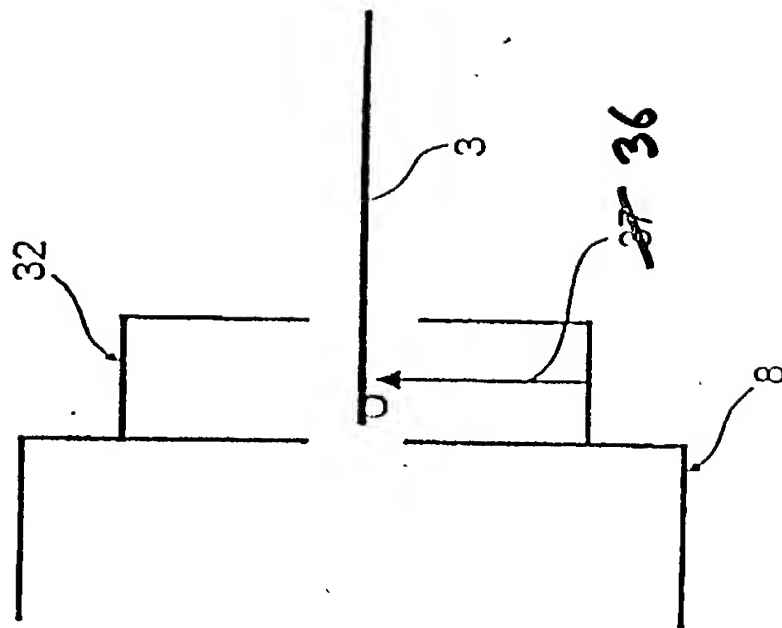
27. An apparatus according to claim 17, wherein a plurality of process containers (8) are disposed one after another.

28. An apparatus according to claim 27, wherein means are provided for introducing different treatment fluids (20) into said process containers (8).

DRAWING PROPOSAL

Ulrich Speh, et al

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DRAWING PROPOSAL

2/parts

APPARATUS FOR TREATING SUBSTRATES

5 The present invention relates to an apparatus for treating substrates, and includes at least one process container that is disposed in a gas atmosphere, contains a treatment fluid, and has at least two continuously open openings that are disposed below a treatment fluid surface and are provided for the linear guidance of the substrates through the container.

10 Such an apparatus, which is known, for example, from EP-A-0 817 246, is a static system with which the treatment fluid stands in the process container without moving. The result of this is that a process taking place in the container is adversely affected by contamination of the treatment fluid, especially in the region of the linear guidance of the
15 substrates through the container. Thus, it is not possible to have a good and homogeneous treatment of the substrates.

20 Furthermore known from JP-A-5-291 223 is an apparatus for the treatment of substrates according to which a process container that can be filled with treatment fluid from above is provided with two lateral openings. The openings can be respectively closed off by closure elements in order during the treatment to prevent an escape of treatment fluid. Provided on the base of the process container is an outlet for the treatment fluid.

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in a simple manner prevent the treatment fluid from flowing out of the process container.

Pursuant to one particularly preferred embodiment of the invention, the height of the overflow means can be adjusted in order to vary the treatment fluid level within the process container. This is particularly advantageous if within the process container treatments are carried out with different treatment fluids that have different densities, and, at the same fluid level, different pressure conditions would result at the openings that are disposed below the treatment fluid surface. These pressure conditions can be set via the height-adjustable overflow means in order to prevent the treatment fluid from flowing out of the openings.

A closed overflow container is preferably provided in order to enable a vacuum to be applied in an air space that is formed above the treatment fluid surface. By means of the vacuum an underpressure can be generated at the openings that are disposed below the treatment fluid surface in order to prevent the treatment fluid from flowing out. Especially in combination with the height-adjustable overflow edge, a simple control of the pressure conditions at the openings can be achieved. In the air space that is located above the treatment fluid a uniform vacuum is preferably provided. The pressure changes that result, for example, due to different treatment fluids (due

5 For a uniform and homogeneous flow within the process container, the treatment fluid can preferably be introduced into the process container via an essentially horizontally disposed diffuser plate. Pursuant to a further embodiment of the invention, a collecting trough is mounted on the outer periphery of the process container below at least one of the openings in order to prevent any treatment
10 fluid that might escape from the process container from contaminating the area around the process container.

causing ultra-sound waves to act on the substrates to promote the treatment thereof, and in particular cleaning processes. In this connection the ultrasonic unit preferably extends over the entire width of the process container, and in particular perpendicular to the direction of movement of the substrates, and is also pivotable in order to provide a uniform impingement of ultra-sound waves over the entire surface of the substrates. To enable a uniform and homogeneous flow of the treatment fluid within the process container, the ultrasonic unit

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process steps. The wetting unit is preferably designed in such a way that the substrates are initially rinsed, thereby preventing treatment fluid from passing from one process container to the next.

The invention will be explained in greater detail subsequently with the aid of preferred exemplary embodiments and with reference to the figures. The drawings show:

Fig. 1 a schematic cross-sectional view of one inventive treatment apparatus;

Fig. 2 an enlarged detailed view of a collecting trough of the treatment apparatus with a drip catcher.

Figure 1 shows a treatment apparatus 1 for a semiconductor wafer 3, with a wetting unit 4, a wafer transport unit 6, a process container 8 and a wafer transport unit 10. Pursuant to the figure, during a treatment of the substrate 3 it is moved from the left by the wafer transport unit 6 past the wetting unit 4 and is subsequently introduced into the process container 8, and is partially pushed therethrough. On the other side, the wafer 3 is received by the wafer transport unit 10 and is withdrawn from the process container 8. Details of the transport device are described in the patent application filed by the same applicant on the same day and having the title "Method and Apparatus for Transporting a Semiconductor Wafer

through a Treatment Container”; to avoid repetition, such application is to this extent made the subject matter of the present invention.

The wetting unit 4 has a plurality of nozzles 11, via which a fluid, for example DI water, is sprayed onto at least one surface of the wafer 3 in order to moisten it, or in the event that it is already moist to keep it moist. Although not illustrated in the figure, the nozzles 11 can be directed counter to the direction of movement of the wafer 3 in order to achieve a rinsing of at least one surface of the wafer 3. In addition to the illustrated wetting unit 4, below which the wafer 3 is moved through, it is also possible to provide a second wetting unit that is disposed across from the wetting unit 4, so that the wafer 3 is moved through both wetting units and is thus moistened from both sides.

The process container 8 is formed by an essentially closed container body 14, which is provided with an introduction opening 15, and an outlet opening 16 as well as an overflow opening 17. The introduction opening 15 and the outlet opening 16 are disposed on a plane on oppositely disposed side walls of the container body 14. Further side walls of the container body 14, which are not provided with the openings 15,16, are provided with guide bars or rails 18 for guiding the wafers 3 within the process container 8.

The openings 15,16 are disposed beneath the overflow opening 17 and are thus disposed beneath a treatment fluid surface of a

treatment fluid 20 that is located in the process container 8. The openings 15,16 can have a special shape, as described, for example, in EP-A-0 817 246, in order to prevent an escape of the treatment fluid 20 that is in the process container 8. To this extent, to avoid repetition, EP-A-0 817 246 is made the subject matter of the present invention.

In the vicinity of the base of the process container 8, there is provided an essentially horizontally extending diffuser plate 22, via which the treatment fluid 20 is introduced from below into the process container 8. By means of the diffuser plate 22, a uniform upwardly directed flow of the treatment fluid 20 within the process container 8 is produced. Provided within the process container are two ultrasonic or megasonic units 24,25 that extend over the entire width (pursuant to the figure perpendicular to the plane of the drawing). The ultrasonic units 24,26 face one another and with regard to their level are disposed below and above the openings 15,16 respectively, so that as the wafers 3 move through the process container they are moved through the ultrasonic units 24,26. Those sides of the ultrasonic units 24,26 that face away from one another are respectively beveled in order to have as little adverse effect as possible upon the fluid flow that is directed upwardly from below in the process container 8.

Provided on the outer periphery of the container body 14, in the region of the introduction opening 15 and below the opening 15, is a

collecting trough 30 in order to catch any treatment fluid that escapes via the opening 15 and to convey it away in a suitable manner that is not illustrated in detail.

5 The outlet opening 16 is surrounded by a drying chamber 32 that is mounted on the outer periphery of the container body 14 and has an integrated collecting trough. The drying chamber 32 has an opening 33 through which the wafer 3 can be moved. Provided within the drying chamber 33 are nozzles 34,35 via which a fluid, which reduces the surface tension of the treatment fluid, can be introduced into the region of the outlet opening 16. A fluid that is suitable as a surface tension reducing fluid is, for example, IPA, a hot gas such as hot N₂, etc. The fluid that reduces the surface tension of the treatment fluid is directed via the nozzles 34,35 in a precise manner upon a meniscus formed between the treatment fluid 20 and the wafer 3 in order at this location to achieve a good drying pursuant to the Marangoni principle. Alternatively, the meniscus could also be heated in some other way, for example with a laser, in order in this region to achieve a reduction of the surface tension. Figure 2 shows an enlarged detailed view of the drying chamber 32, whereby for the sake of simplifying illustration the nozzles 34,35 have been left out. As can be recognized from Figure 2, provided in a lower half of the drying chamber 32 is a needle-shaped element 36 that serves as a drip

catcher. At the rear edge of the wafer the drying process via the Marangoni effect during discharge from the chamber is critical, and it is possible for dense fluid to adhere to the wafer and to form a drop. This drop is, however, drawn off by the drip catcher 37, which is positioned at a slight distance, for example > 1 millimeter, from the wafer and at the center thereof.

Provided in the upper wall of the container body 14 is a non-illustrated opening that is in communication with a vacuum device 37, so that an underpressure can be applied in an air space 40 that is formed above the treatment fluid 20 in order to prevent the treatment fluid from flowing out of the process container 8. Other means could also be provided on or in the process container 8 in order to prevent the treatment fluid from flowing out, such as described, for example, in EP-A-0 817 246, which in order to avoid repetition is to this extent made the subject matter of the present application.

The overflow opening 17 is surrounded by an essentially closed overflow container 42 that is secured in a sealed manner on the outer periphery of the container body 14. Provided within the overflow container 42, i.e. on an outer wall of the process container body 14, is a slide unit 44 that defines an overflow edge 45. The slide unit 44 can be displaced vertically by means of a non-illustrated device in order to set the height of the overflow edge 45 and hence to set the level of the

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the treatment fluid pressure that exists at the openings 5,16. In this connection, all of the successively arranged process containers 8 are preferably connected to a single vacuum device, which produces a respectively uniform underpressure in the respective process containers or at the same height of the slide unit generates different underpressures. Pressure differences that result at the openings 15,16 due to the different densities of the treatment fluids are compensated for by means of the slide unit 4 and hence by the level of the treatment fluid of the process containers, so that no treatment fluid escapes from the process containers 8 via the openings 15,16.

During the treatment of the wafers 3, treatment fluid 20 is first introduced via the diffuser plate 22 into the process container 8 until this fluid flows over the overflow edge 45 of the slide unit 44 into the overflow container 42. Treatment fluid is continuously introduced into the process container 8 via the diffuser plate 22, so that a homogeneously upwardly directed flow results within the process container. Subsequently, by means of the introduction opening 15 a wafer 3 is pushed into the process container 8 and is pushed partially therethrough. In so doing, the front and back sides of the wafer 3 are acted upon by the ultrasonic units 24,26. The wafers 3 are guided within the process container 8 by the lateral guides 18. When a front end of the wafer 3 is guided through the process container 8, the

thereby resulting meniscus between the treatment fluid 20 and the wafer 3 is acted upon by a fluid that reduces the surface tension of the treatment fluid 20, as a result of which the wafer 3 is dried during the removal from the treatment fluid 20. The guiding end of the wafer 3 is taken up by the transport unit 10 and is pulled completely through the process container 8 and, as the case may be, is transported to a following process container 8.

Although the invention has been described with the aid of one preferred embodiment, it should be noted that the invention is not limited to this embodiment. For example, the features of the drying chamber 32 are not necessary with process containers 8 that are followed by a further process container. Furthermore, the precise configuration of the ultrasonic unit is not mandatory, since depending upon the substrate that is to be treated, for example a single ultrasonic unit is sufficient for the treatment of a substrate surface. A diffuser plate 22 is also not absolutely necessary, and in place thereof, or in combination with the diffuser plate, a funnel-shaped base having an inlet opening could be provided. The vacuum device 37 is also not absolutely necessary, since the pressure that exists at the openings 15,16 can also be regulated by other means, such as, for example, a capillary device. The pressure that is necessary in this connection is regulated by the movable slide unit 44. The respective features of the

treatment apparatus 1 can be used in combination with one another or respectively also individually, i.e. independently of one another.

6. Apparatus according to one of the preceding claims, characterized in that the treatment fluid (20) can be introduced into the

process container (8) via an essentially horizontally disposed diffuser plate (22).

7. Apparatus according to one of the preceding claims, characterized by a collecting trough (30) that is mounted on the outer periphery of the process container (8) beneath at least one of the openings (15,16).

8. Apparatus according to claim 7, characterized by a drip catcher in the collecting trough.

9. Apparatus according to one of the preceding claims; characterized by at least one ultrasonic unit (24,26) within the process container (8).

10. Apparatus according to claim 9, characterized in that the ultrasonic unit (24,26) in the process container (8) extends over the entire width, perpendicular to the direction of movement of the substrates (3).

11. Apparatus according to claim 9 or 10, characterized in that the ultrasonic unit (24,26) has an aerodynamic shape.

12. Apparatus according to one of the preceding claims, characterized in that the substrate (3) can be moved through between at least two ultrasonic units (24,26) that face one another.

13. Apparatus according to one of the preceding claims, characterized by a drying chamber (32) that surrounds an outlet

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(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
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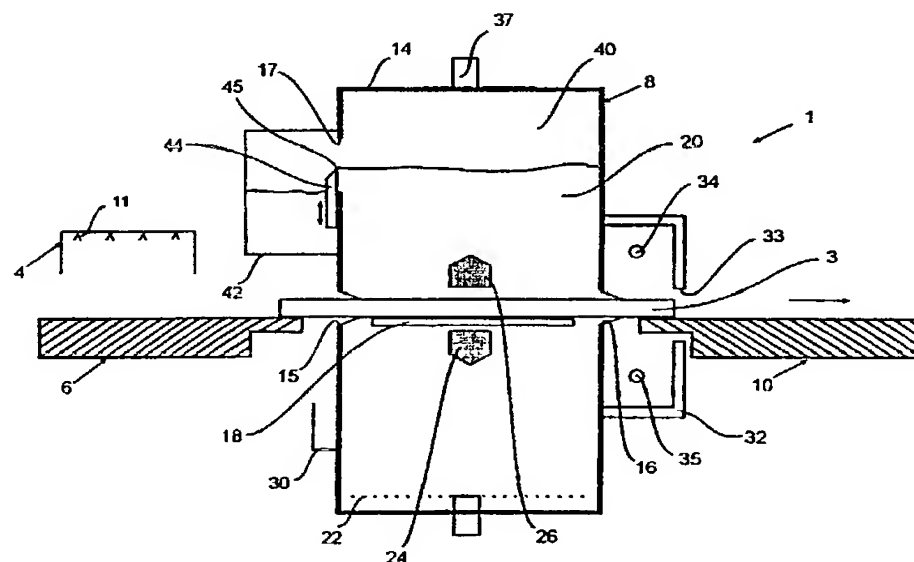
(71) Anmelder (für alle Bestimmungsstaaten mit Ausnahme von US): STEAG MICROTECH GMBH [DE/DE];
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Zur Erklärung der Zweibuchstaben-Codes, und der anderen
Abkürzungen wird auf die Erklärungen ("Guidance Notes on
Codes and Abbreviations") am Anfang jeder regulären Ausgabe
der PCT-Gazette verwiesen.

(72) Erfinder; und
(75) Erfinder/Anmelder (nur für US): SPEH, Ulrich

(54) Title: DEVICE FOR TREATING SUBSTRATES

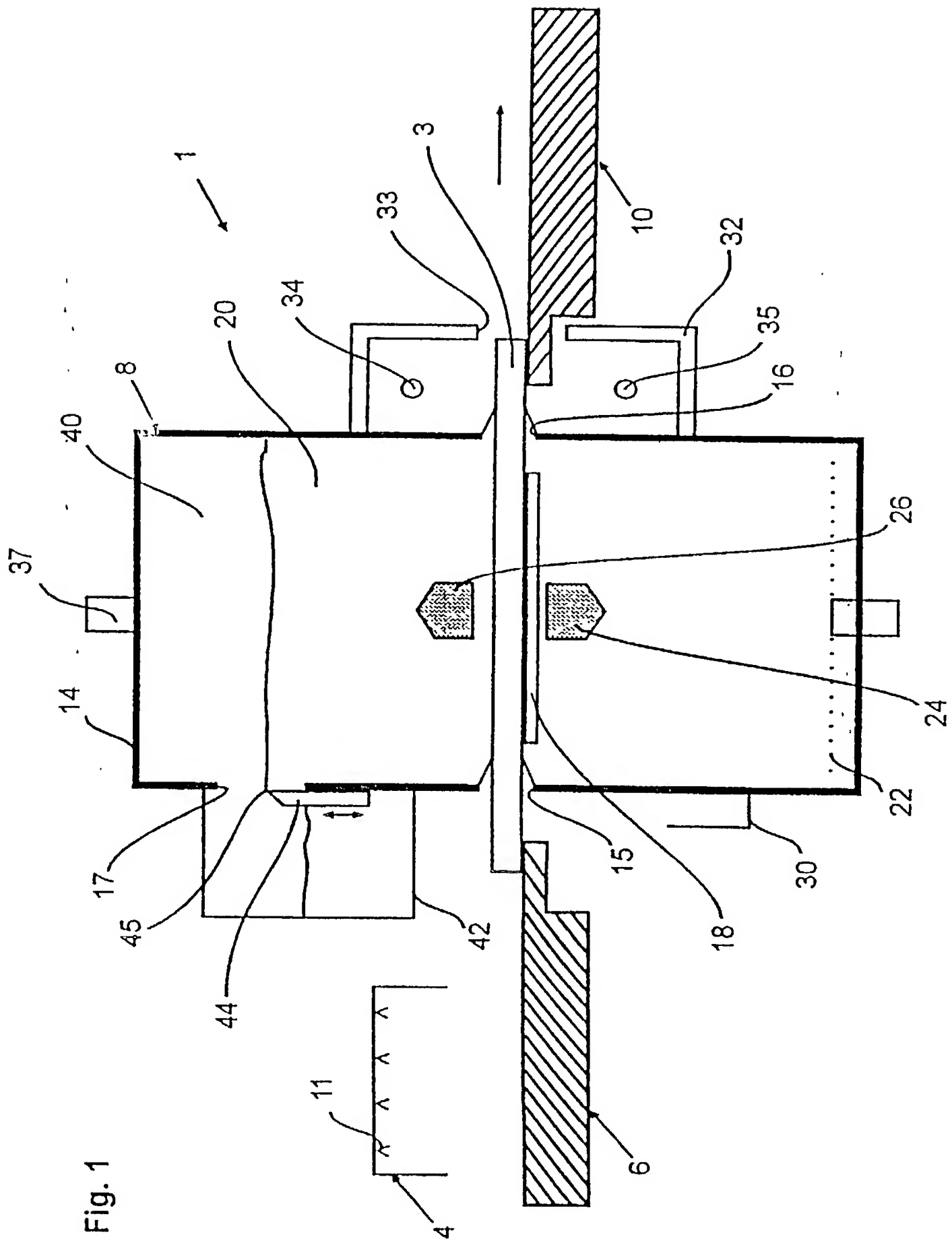
(54) Bezeichnung: VORRICHTUNG ZUM BEHANDELN VON SUBSTRATEN



(57) Abstract: The aim of the invention is to attain a uniform and homogeneous treatment of substrates in a device comprising at least one process container which is arranged in a gas atmosphere and which contains a treatment fluid. Said process container also comprises at least two openings which are located underneath a treatment fluid surface and through which the substrates are linearly guided. In addition, an overflow for the treatment fluid is provided.

(57) Zusammenfassung: Zum Erreichen einer gleichmässigen und homogenen Behandlung von Substraten in einer Vorrichtung mit wenigstens einem in einer Gasatmosphäre angeordneten, ein Behandlungsfluid enthaltenden Prozessbehälter, der wenigstens zwei unterhalb einer Behandlungsfluidoberfläche liegende Öffnungen zum linearen Durchführen der Substrate aufweist, ist ein Überlauf für das Behandlungsfluid vorgesehen.

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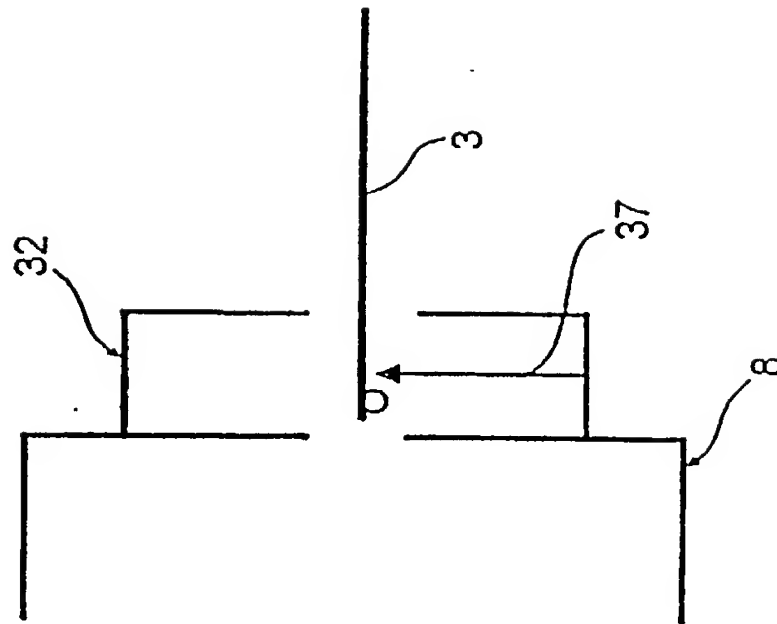


Fig. 2

Attorney Docket No.
AZ 3049

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As below named inventors, we hereby declare that:

Our residences, post office addresses and citizenships are as stated below next to our names; we believe we are the original, first and joint inventors of the subject matter which is claimed and for which a patent is sought of the invention entitled:

APPARATUS FOR TREATING SUBSTRATES
the specification of which,

_____ is attached hereto;
X was filed on 14 July 2000 as International Application Ser No PCT/EP00/06716 and is amended herewith. as 10/031,923

We hereby state that we have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above

We acknowledge the duty to disclose all information known by me to be material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56

We hereby claim foreign priority benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed.

| Prior Foreign Application(s): | | | Priority Claimed | |
|-------------------------------|-----------|------------------------|------------------|----|
| 199 34 300.4 | Germany | 21 July 1999 | X | |
| (Number) | (Country) | (Day/Month/Year Filed) | Yes | No |

We hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

| (Application Number) | (Filing Date) |
|----------------------|---------------|
| | (1) |

We hereby appoint attorney Robert W. Becker, Reg. No. 26,255, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith. Address all telephone calls to (505) 286-3511. Address all correspondence to ROBERT W. BECKER & ASSOCIATES, 707 Highway 66 East, Suite B, Tijeras, New Mexico 87059.

We hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon

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Decl - Pg 2
Attorney Docket No:
AZ 3049

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